

# **Commonwealth Edison Company's Quarterly Smart Grid Test Bed Report**

**August 14, 2014**

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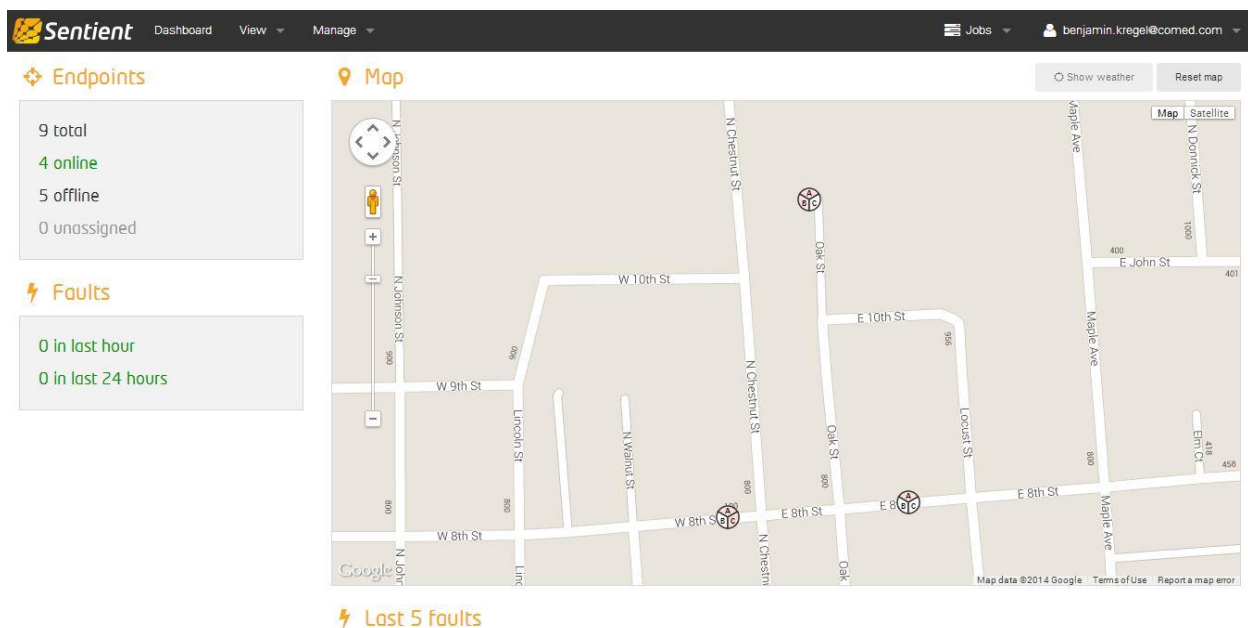
## Introduction

This report summarizes the test bed activities, customers, discoveries, and other information deemed mutually relevant from April 1, 2014, through June 30, 2014 as described in subsection (i) of Section 16-108.8 of the Public Utilities Act (“Act”).

## Active Test Bed Demonstration Projects

### *Sentient Energy*

ComEd completed installation of nine overhead line monitoring devices associated with the Sentient Energy Test Bed demonstration project during the first quarter of 2014 to demonstrate voltage and current sensing capabilities, including fault current indication. These devices include cellular radios to wirelessly communicate information back to Sentient and ComEd. Since that time, Sentient has been collecting data from the devices and providing information to ComEd, such as line voltage and current, as well as event notification. The following screen shots illustrate the types of information ComEd is able to retrieve from the devices via the Sentient cloud software interface.



**Figure 1: Map of device installation locations (3 devices per location)**

Sentient Dashboard View Manage Jobs benjamin.kregel@comed.com

cFCI

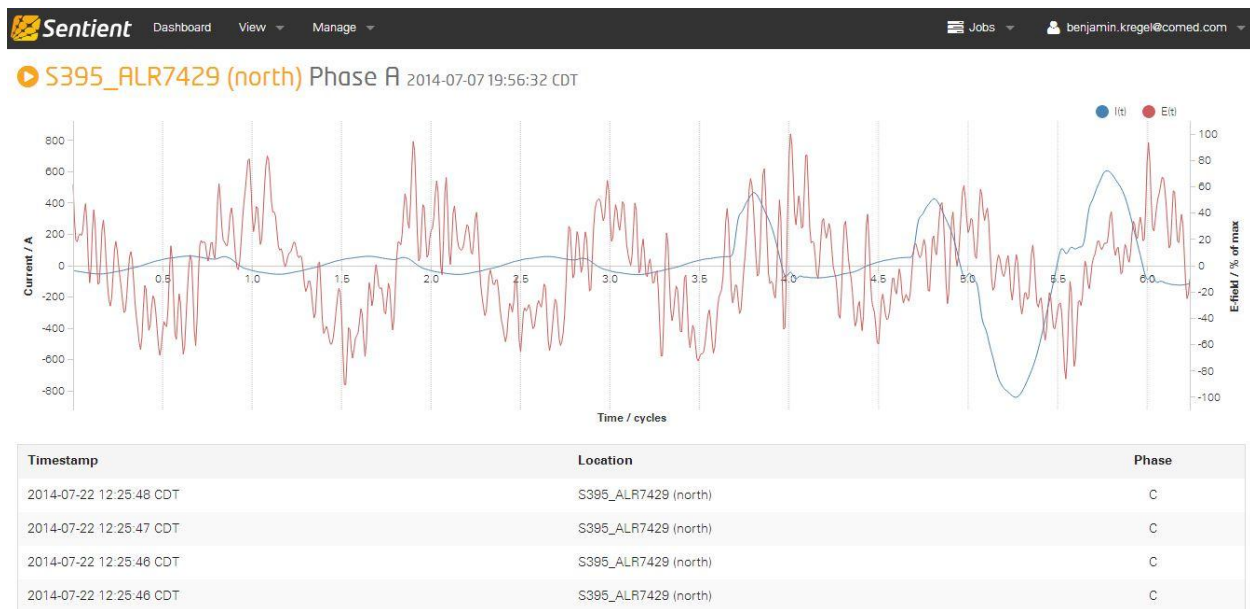
FILTER: High temperature High RMS current cFCI fixed trip cFCI percent change trip cFCI dl/dt trip cFCI loss of source

Timestamp	Endpoint	Detector	Value
06-14-2014 06:03:43 CDT	S395_ALR7029 (west) Phase B	High RMS current	506 A
06-14-2014 06:03:43 CDT	S395_ALR7029 (west) Phase B	High RMS current	663 A
06-14-2014 06:03:41 CDT	S395_ALR7029 (west) Phase B	High RMS current	508 A
06-14-2014 06:03:41 CDT	S395_ALR7029 (west) Phase B	High RMS current	2019 A
05-12-2014 21:52:36 CDT	S395_ALR7429 (north) Phase A	High RMS current	502 A
05-12-2014 21:52:36 CDT	S395_ALR7429 (north) Phase A	High RMS current	553 A
05-12-2014 21:52:36 CDT	S395_ALR7429 (north) Phase A	cFCI dl/dt trip	519 A

**Figure 2: Event Notifications**



**Figure 3: Per-Phase Current Profiles**



**Figure 4: Single-Phase Current Waveform**

As Figure 1 illustrates, Sentient has experienced issues with some of the cellular modems in the devices, and has shipped replacement devices for ComEd to install.

Sentient is currently developing similar line sensors with capability to communicate via the Silver Spring wireless mesh communications network and expects to make these devices available for testing by end of year. Additionally, Sentient is developing a range extender (repeater) to extend the reach of the Silver Spring network to Sentient devices. ComEd plans to test these additional devices and range extenders within the footprint of its Silver Springs mesh radio network test environment to demonstrate the ability of the devices to interface with the wireless communications network that ComEd is currently deploying for smart meter and distribution automation; as well as various advanced power quality measurement capabilities of the devices.

## ***GlidePath, LLC***

Additionally during the first quarter of 2014, ComEd received and approved one new Test Bed Application from GlidePath Power, LLC. GlidePath is currently developing three 20MW battery storage facilities within the ComEd footprint of PJM. These facilities are intended to participate in the PJM frequency regulation market and will be located in McHenry, West Chicago, and Joliet, respectively. Construction is projected to be complete in 2015. Along with participating in the PJM regulation market, GlidePath wishes to demonstrate various grid support capabilities in ComEd's Test Bed, such as:

- Distributed fast frequency control
- Smart inverter functionality and capability to limit impacts of the battery facilities on grid equipment (e.g., substations)
- Distributed dynamic volt/VAR support, and how this can co-exist with the frequency control noted above

ComEd is in the process of developing a detailed scope of work and project agreement, pending completion of interconnection agreements with GlidePath.

## **Additional Activities**

### ***Superconductor Development***

ComEd is partnering with American Superconductor (AMSC) and the U.S Department of Homeland Security (DHS) to perform a 6-month feasibility study that would lead to a 3.8 mile superconducting cable loop installation in the heart of downtown Chicago. The superconductor cable would interconnect key electrical substations in the city and provide enhanced security and redundancy to critical infrastructure. Given the significant level of external funding and the size and scale of the project, one of the project goals is to significantly reduce the cost of manufacturing the superconductor

cables. The Chicago superconducting cable loop will serve as the benchmark for what is achievable with the technology and will open the door for similar projects that can bolster the reliability of the electric grid in major cities and financial hubs around the world.

### ***Fleet Demonstration of Electric Vehicles***

Through a partnership with General Motors and the Electric Power Research Institute (EPRI), ComEd recently completed a demonstration of 11 Chevrolet Volt extended range electric vehicles in its vehicle fleet to better understand the costs, benefits and impact of operating EVs in a large commercial fleet application. Each of the vehicles was equipped with data loggers that captured information such as driving patterns, charging cycles, and gasoline vs. electric usage. In the last year, ComEd and EPRI have worked together to analyze the data to understand the impacts of various factors on the vehicles' electric range, such as driving efficiency, ambient temperature, and average driving speed. This analysis has provided ComEd with valuable insight into the operation of these Chevrolet Volts, as well as opportunities to improve the benefits of electric driving as the Company continues to expand use of EVs in its vehicle fleet.

### ***Fuel Cell Demonstration***

ComEd is working with Toshiba to showcase the first implementation of a Toshiba fuel cell in the United States. The initial Toshiba Ene-Farm unit, originally designed for residential applications in Japan, is being planned for installation at Brookfield Zoo to support electricity and hot water needs for the Stingray Bay exhibit in the spring of 2015. The demonstration will help ComEd better understand the operation of the technology and the exhibit will serve to educate the public on fuel cell technology. Toshiba is

presently evaluating the necessary steps to certify their fuel cell for use in the U.S., including national and local codes, standards and safety requirements.

### ***JCESR***

ComEd is participating in the Joint Center for Energy Storage Research (JCESR). Led by Argonne National Laboratory, the focus of JCESR is to make significant improvements in capabilities of battery storage while reducing costs. ComEd is represented on the JCESR Venture Advisory Council, and is part of a steering committee that is developing a symposium on integration of energy storage into the grid, to be held at the University of Illinois at Urbana-Champaign in October. This one-day conference will feature presentations and panel discussions from academic and corporate partners. Topics will cover energy storage from the perspective of generation, transmission, and distribution; and from the scientists creating energy storage solutions.

### ***Energy Foundry***

ComEd continues to support the Energy Foundry in its mission to foster innovative new grid-related and energy-related products and services. ComEd's vice president of smart grid and engineering holds weekly office hours at the Foundry's Coalition Space in downtown Chicago to talk face-to-face with entrepreneurs and provide the utility perspective as they develop new ideas.